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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

First Named
Inventor : Pradeep K. Subrahmanyam
Appln. No. : 09/767,546
Filed : January 23, 2001
For : DISC STORAGE SYSTEM WITH
ADAPTIVE PID CONTROL
Docket No.: S01.12-0644

Appeal No. _____

Group Art Unit: 2651

Examiner: Andrew L.
SnieszakREQUEST FOR REINSTATEMENT OF APPEAL
UNDER 37 CFR 1.193(b)(2)(ii)

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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18 DAY OF February, 2004

PATENT ATTORNEY

Sir:

This request is responsive to an Office Action of December 16, 2003. In the Office Action, the Examiner takes action following Applicant's Appeal Brief filed 9/12/03. The Examiner withdrew the finality of the previous Office Action and issued a new Office Action in which claims 19 to 34 and 36 were finally rejected.

Applicant hereby requests reinstatement of the appeal under 37 CFR 1.193(b)(2)(ii). Applicant also submits herewith a supplemental appeal brief.

Respectfully submitted,
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Examiner: Andrew L.
Snieszak**SUPPLEMENTAL BRIEF FOR APPELLANT**

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P.O. BOX 1450, ALEXANDRIA, VA 22313-
1450, THIS

10 DAY OF February, 2004

PATENT ATTORNEY

Sir:

This is a supplemental appeal from an Office Action dated December 16, 2003 in which claims 19 to 34 and 36 were finally rejected. Applicant also submits herewith a request for reinstatement of appeal under 37 CFR 1.193(b)(2)(ii).

REAL PARTY IN INTEREST

Seagate Technology LLC, a corporation organized under the laws of the State of Delaware, and having offices at 920 Disc Drive, Scotts Valley, California 95066, has acquired the entire right, title and interest in and to the invention, the application, and any and all patents to be obtained therefor, as set forth in the Assignment filed with the patent application and recorded on Reel 011478, frame 0762.

RELATED APPEALS AND INTERFERENCES

There are no known related appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

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STATUS OF THE CLAIMS

- I. Total number of claims in the application.
Claims in the application are: 1-36
- II. Status of all the claims.
- A. Claims cancelled: 1-18
 - B. Claims withdrawn but not cancelled: none
 - C. Claims pending: 19-36
 - D. Claims allowable but objected to: 35
 - E. Claims rejected: 19-34, 36
- III. Claims on appeal
The claims on appeal are: 19-34, 36

STATUS OF AMENDMENTS

An Amendment after Final was filed on July 16, 2003. The Examiner mailed a reply on August 1, 2003. Applicant filed an Appeal Brief September 12, 2003. After considering the Appeal Brief, the Examiner mailed an Office Action on December 16, 2003, withdrawing the finality of the previous Office Action and setting forth new grounds for rejection. The Office Action was made FINAL. This Supplemental Appeal Brief responds to the new grounds for rejection set forth in the Office Action of December 16, 2003.

SUMMARY OF INVENTION

FIG. 1 pictorially illustrates an embodiment of a disc drive 100 in which a portion 132 of a controller 130 receives a sensed actuator position on line 138 and provides a control output on line 146 that controls actuator position. The arrangement is used to adaptively control a read/write head position to a desired actuator position indicated by a setpoint 152 received from a CPU of a computer. The portion 132 of controller 130 includes adaptive parameter data \hat{A} stored in RAM 142, and an adaptive controller

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process or algorithm stored in ROM 144. In one embodiment, the adaptive parameter data \hat{A} is an estimate of a ratio A of an inertia J to a torque constant K_t of the actuator. The operation of the controller is described in the specification on page 4, lines 7-28. Successively more detailed block diagram examples of a controller such as the one described in FIG. 1 are shown in FIGS. 2 and 3. A flow chart in FIG. 6 shows a discrete algorithm example of operation of a controller such as the one shown in FIG. 1.

FIG. 2 is a block diagram illustration of a disc drive 200, that has a controller portion 132 that includes an adaptive controller 202 that controls a voice coil motor 204 that positions a read/write head 206 on a disc 126. The operation of the controller is described in more detail in Equation 22 (specification, page 12) and by way of an example illustrated in FIG. 3. The controller portion 132 also includes an adaptive system 210 that provides adaptive parameter data \hat{A} along line 212 to the adaptive controller 202. The adaptive system 210 receives data on line 211, 213 and calculates the adaptive parameter data \hat{A} , typically based on a position error signal and a setpoint. The operation of the disc drive 200 is described in the specification on page 5, line 2 to page 6, line 12.

FIG. 3 illustrates a block diagram of an adaptive controller 201. The controller 201 includes a nominal controller 222 with transfer function G_1 , an algebraic part controller 224 with transfer function G_2 and a feedforward controller 226 with a transfer function G_3 . The algebraic part controller 224 and the feedforward controller 226 receive adaptive parameter data \hat{A} on line 212. The outputs of the controllers 222, 224, 226 are summed at a summing junction 234 and the sum is provided as the output 203 of the controller 201. The function of the nominal controller 222 is described in Equations 3-11. The function of the algebraic part controller is defined in an equation at page 11, line 14. The summed function of the nominal controller 222 and the algebraic

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controller 224 is described in Equation 17 on page 11. The summed function of the nominal controller 222, the algebraic controller 224 and the feedforward controller 226 is described in Equations 22-23 on page 12.

FIGS. 4, 5 and 7 illustrate performance of parts of an adaptive controller in the form of root locus (FIG.4), Bode plot (FIG. 5) and computer simulated time response (FIG.7).

FIG. 6 illustrates a flow chart of digital (discrete) methods of calculating an updated adaptive parameter \hat{A}_N and of calculating an adaptively updated controller output U_N using the adaptive parameter data \hat{A}_N . The adaptive parameter data \hat{A}_N is an estimate of ratio A of inertia J to torque constant K_t in of the actuator.

DESCRIPTION OF REFERENCES RELIED ON BY THE EXAMINER

The Examiner cites the following references:

Baba U.S. Patent 5,875,162

Clare et al. U.S. Patent 5,898,286

Copies of the references are provided in Appendix B.

ISSUES

1.-Whether Claims 19, 20, 28, 31-34 are novel under 35 USC 102(e) in view of Baba U.S. Patent 5,875,162.

2.-Whether Claims 21-24, 26, 27, 29, 30 and 36 are non-obvious under 35 USC 103(a) over Baba U.S. Patent 5,875,162 in view of Clare et al. U.S. Patent 5,898,286.

3.-Whether Claim 25 is non-obvious under 35 USC 103(a) over Baba U.S. Patent 5,875,162 in view of Clare et al. U.S. Patent 5,898,286 and further in view of the Examiner's "official notice".

4.-Whether Claim 19 provides enablement under 35 USC 112, first paragraph.

5.-Whether Claim 28 provides enablement under 35 USC 112, first paragraph.

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GROUPING OF CLAIMS

The following groupings of claims are made solely in the interest of consolidating issues and expediting this Appeal. No grouping of claims is intended to be nor should be interpreted as being any form of admission or a statement as to the scope or obviousness of any limitation.

- Group I: Claims 19, 20, 28, 31-34
- Group II: Claims 21-24, 26, 27, 29, 30, 36
- Group III: Claim 25
- Group IV: Claim 19
- Group V: Claim 28

ARGUMENT

Prior to discussing each of the art rejections appearing below as Issues 1-3, Appellant would first like to draw the board's attention to the meanings of the terms "feedback control," "adaptive control," "adapting," and "self-adapting" as used in the relevant field of control systems art. The Instrument Society of America's Dictionary of Measurement and Control, (Third Edition, 1995, ISBN 1-55617-528-0), defines these terms as follows:

feedback control. An error-driven control system in which the control signal to the actuators is proportional to the difference between a command signal and a feedback signal from the process variable being controlled. See "control, feedback."

control, feedback. Control in which a measured variable is compared to its desired value to produce an actuating error signal which is acted upon in such a way as to reduce the magnitude of the error.

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control, adaptive. Control in which automatic means are used to change the type or influence (or both) of control parameters in such a way as to improve the performance of the control system.

adapting. See "self-adapting."

self-adapting. Pertaining to the ability of a system to change its performance characteristics in response to its environment.

In considering the art cited, the Examiner is finding examples in the art of what is ordinary "feedback control" and construing those examples as "adaptive control" without a basis for doing so. As pointed out in the above definition of "adaptive control" (provided to the Examiner in the Appellant's Amendment after Final), "adaptive control" includes an automatic change to the type or influence of control parameters that is in addition to the feedback control. In art cited by the Examiner, controllers are taught that generate control outputs, however the controllers have control parameters that are not disclosed to be automatically adapted. In the claims on appeal, each claim includes an "adaptively generating" limitation in combination with a limitation to "at least one of a torque and an inertia," which limitations are not disclosed in the art cited by the Examiner.

In the Examiner's "Response to Arguments" in the Office Action of December 16, 2003, the Examiner acknowledged the definitions provided above and further provided a definition for "adaptive system" from a Microsoft Press Computer Dictionary. The Examiner then asserted that "Baba teaches a system that alters its behavior based on features of its experience or environment. The Examiner's comments tend to indicate that the Examiner is still confusing a control system changing its outputs (but not its own

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control parameters) to adapt to changes to input (ordinary feedback control) with a much different control system in which a control system changes its own behavior or control parameters (adaptive control) to improve the performance of the control system while at the same time providing feedback control.

The Examiner noted that there was "not a one to one correspondence" between the definition "adaptive control" and the claim language. However, as shown above, the word "adapting" is also separately defined by the Dictionary of Measurement and Control and thus corresponds closely with applicant's claim language such as "adaptively," "adapted" and "adaptive."

1. (Group I Claims) Claims 19, 20, 28, 31-34 are novel under 35 USC 102(e) in view of Baba U.S. Patent 5,875,162.

The Examiner rejected Claims 19, 20, 28, 31-34 under 35 USC 102(e) in view of Baba U.S. Patent 5,875,162.

In making the rejection under 35 USC 102(e), the Examiner has failed to construe, or has not correctly construed the limitation "adaptively" according to its meaning in the relevant field of control system art. Baba teaches controllers that provide only feedback control as discussed above. There is no disclosure in Baba of "...adaptively generating an output responsive to .. at least one of a torque and an inertia..." or "...adaptively generating an output which is based on adaptive parameter data as presently featured in claims 19 and 28.

Anticipation requires the disclosure in a single art reference of each element of the claim under consideration. W.L. Gore & Assoc. v. Garlock, Inc., 220 USPQ 303, 313 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984). However, as stated above, the "...adaptively generating an output responsive to .. at least one of a torque and an inertia..." limitation in claims 19 and 28 is not disclosed in the Baba reference. The rejection under 35 USC 102(e) is therefore improper. As a result, claims 19, 28

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and 32, along with dependent claims 20 and 31-34 are not anticipated and are allowable.

For these reasons, applicant requests withdrawal of the rejections under 35 USC 102(e) and allowance of Claims 19, 20, 28, 31-34.

2. (Group II Claims) Claims 21-24, 26, 27, 29, 30 and 36 are non-obvious under 35 USC 103(a) over Baba U.S. Patent 5,875,162 in view of Clare et al. U.S. Patent 5,898,286.

The Examiner rejected claims 21-24, 26, 27, 29, 30 and 36 as obvious under 35 USC 103(a) over Baba U.S. Patent 5,875,162 in view of Clare et al. U.S. Patent 5,898,286.

As discussed above in arguments concerning Issue 1, the limitation in each of the Appellant's rejected claims to "...adaptively generating an output responsive to .. at least one of a torque and an inertia..." is not taught in Baba. The limitation in each of the rejected claims to "...adaptively generating an output responsive to .. at least one of a torque and an inertia..." is also not taught in the secondary reference Clare et al. cited by the Examiner. There is no suggestion in either Baba or Clare et al. of "...adaptively generating an output responsive to .. at least one of a torque and an inertia...." The claimed feature of "...adaptively generating an output responsive to .. at least one of a torque and an inertia..." is completely absent from the art cited by the Examiner.

To imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher. W.L. Gore & Assoc. v. Garlock, Inc., 220 USPQ 312-13 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984).

The "...adaptively generating an output responsive to .. at

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least one of a torque and an inertia..." limitation in the Appellant's claim is not taught or suggested in either the Baba reference or the Clare et al. reference. The reading of the "adaptively generating" limitation into the references appears to be based improperly on hindsight. As argued above, the Examiner is misinterpreting prior art reference that show only "feedback control" as if they included "adaptive control." The rejection under 35 USC 103(a) is therefore improper. Therefore, claims 21-24, 26, 27, 29, 30 and 36 are not obvious and are allowable.

For these reasons, applicant requests withdrawal of the rejections under 35 USC 103(a) and allowance of Claims 21-24, 26, 27, 29, 30 and 36.

3. (Group III Claim) Claim 25 is non-obvious under 35 USC 103(a) over Baba U.S. Patent 5,875,162 in view of Clare et al. U.S. Patent 5,898,286 and further in view of the Examiner's "official notice".

As discussed above in arguments concerning Issue 2, the feature of "adaptively controlling" is not taught or suggested by the Baba and Clare et al. references. The addition of the Examiner's "official notice" concerning pulse width modulation as a substitute for a digital to analog converter in Clare et al. does not add anything that relates to "adaptively controlling" as claimed in Claim 25, and the assertion of "official notice" by the Examiner is moreover unsupported by any references.

Assertions of technical facts in areas of esoteric knowledge must always be supported by citation to some reference work recognized as standard in the pertinent art and the appellant given, in the Patent Office, the opportunity to challenge the correctness of the assertion or the notoriety or repute of the cited reference....Allegations concerning specific "knowledge" of the prior art, which might be peculiar to a particular art should also be supported and the applicant similarly given the

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opportunity to make a challenge. In re Pardo, 214 USPQ 673, 677 (C.C.P.A. 1982).

The assertion of "official notice" concerning pulse width modulation has not been supported by the Examiner and, in view of the above arguments concerning Issue 1 and Issue 2 is also irrelevant to the issue of patentability of claim 25. The rejection based on "official notice" is therefore improper.

For these reasons, applicant requests withdrawal of the rejections under 35 USC 103(a) and allowance of Claim 25.

4. (Group IV claim) Whether Claim 19 provide enablement under 35 USC 112, first paragraph.

The Examiner wrote that he rejected Claim 19 under 35 USC 112, first paragraph:

"because the specification, while being enabling for specific arrangements such as those group of elements as depicted for example in figure 2, does not reasonably provide enablement for every conceivable structure for achieving the stated result of adaptively generating an output as set forth by the claims. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims."

In support of these assertions of non-enablement, the Examiner cited In Re Hyatt, 708 F.2d 712, 714-715, 218 USPQ 195, 197 (Fed. Cir. 1983). Claim 19 reads:

"19. An apparatus for adaptively generating an output responsive to a sensed position signal, a desired position signal and at least one of a torque and an inertia."

The In Re Hyatt decision cited by the Examiner is limited in its scope to a single element means-plus-function claim. Claim 19 is drawn to "An apparatus..." Claim 19 does not include a means-plus-function element and is not a single element means-plus-

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function claim such as the claim considered in In Re Hyatt. Absent the "means-plus-function" language in the claim, there is no basis for the Examiner's assertion that Claim 19 "covers every conceivable structure for achieving a stated result". Claim 19 is expressly limited to an apparatus that responds to a sensed position signal, a desired position signal and at least one of a torque and an inertia and that adaptively generates an output.

Embodiments which are enabling are disclosed at least in FIGS. 2-3 of the application. For a non-chemical claim such as Claim 19, "if an invention pertains to an art where the results are predictable, e.g., mechanical as opposed to chemical arts, a broad claim can be enabled by disclosure of a single embodiment ... and is not invalid for lack of enablement simply because it reads on another embodiment of the invention which is inadequately disclosed. Spectra-Physics, Inc. v. Coherent, Inc., 827 F. 2d 1524, 3 USPQ 2d 1737 (Fed Cir.), cert. denied, 484 U.S. 954 (1987).

Claim 19 is not a means-plus-function claim and is not so broad that it covers every conceivable structure for achieving a stated result. Claim 19 is limited to only those embodiments in which an apparatus responds to a sensed position signal, a desired position signal and at least one of a torque and an inertia and those embodiments that adaptively generate an output. Claim 19 is validly enabled by the embodiments disclosed in the application, and there is no requirement that the application disclose every embodiment that might be covered by Claim 19. For these reasons, the Examiner's rejection of Claim 19 based on 35 USC 112, first paragraph is improper, and Claim 19 should be allowed.

5. (Group V claim) Whether Claim 28 provides enablement under 35 USC 112, first paragraph.

The Examiner wrote that he rejected Claim 28 under 35 USC 112, first paragraph:

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"because the specification, while being enabling for specific arrangements such as those group of elements as depicted for example in figure 2, does not reasonably provide enablement for every conceivable structure for achieving the stated result of adaptively generating an output as set forth by the claims. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims."

In support of these assertions of non-enablement, the Examiner cited In Re Hyatt, 708 F.2d 712, 714-715, 218 USPQ 195, 197 (Fed. Cir. 1983). Claim 28 reads:

"28. An apparatus comprising:
adaptive parameter data based on at least one of a torque and an inertia; and
a controller circuit for receiving a sensed position signal and adapted to receive reference data indicating a desired position, for adaptively generating an output which is based on the adaptive parameter data."

As discussed above in Issue 4, the In Re Hyatt decision cited by the Examiner is limited in its scope to a single element means-plus-function claim. Claim 28 is drawn to "An apparatus...." Claim 28 recites two elements. Claim 28 does not include a means-plus-function element and is not a single element means-plus-function claim such as the claim considered in In Re Hyatt. Absent the "means-plus-function" language in the claim, there is no basis for the Examiner's assertion that Claim 28 "covers every conceivable structure for achieving a stated result". Claim 28 is expressly limited to an apparatus that comprises two separate elements, adaptive parameter data and a controller circuit.

Embodiments which are enabling are disclosed at least in FIGS. 2-3 of the application. For a non-chemical apparatus claim such as Claim 28, "if an invention pertains to an art where the results are predictable, e.g., mechanical as opposed to chemical

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arts, a broad claim can be enabled by disclosure of a single embodiment ... and is not invalid for lack of enablement simply because it reads on another embodiment of the invention which is inadequately disclosed. Spectra-Physics, Inc. v. Coherent, Inc., 827 F. 2d 1524, 3 USPQ 2d 1737 (Fed Cir.), cert. denied, 484 U.S. 954 (1987).

Claim 28 is not a single element claim and is not a means-plus-function claim and is not so broad that it covers every conceivable structure for achieving a stated result. Claim 28 is limited to only those embodiments in which an apparatus responds to a sensed position signal, a desired position signal and at least one of a torque and an inertia and those embodiments that adaptively generate an output. Claim 28 is validly enabled by the embodiments disclosed in the application, and there is no requirement that the application disclose every embodiment that might be covered by Claim 28. For these reasons, the Examiner's rejection of Claim 28 based on 35 USC 112, first paragraph is improper, and Claim 28 should be allowed.

Conclusion

For the reasons advanced above, Appellant contends that each of the Claims on appeal is patentable. Therefore, reversal of all the rejections is requested.

Respectfully submitted,

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Appendix A

19. An apparatus for adaptively generating an output responsive to a sensed position signal, a desired position signal and at least one of a torque and an inertia.

20. The apparatus of Claim 19, wherein the apparatus further comprises a controller circuit that has a controller gain that is adapted in a fixed range as a function of adaptive parameter data.

21. The apparatus of Claim 20 further comprising:
an adaptive system generating the adaptive parameter data according to an update equation.

22. The apparatus of Claim 21 wherein the adaptive system generates the adaptive parameter data based on both the torque and the inertia.

23. The apparatus of Claim 20 wherein the controller circuit is a discrete controller.

24. The apparatus of Claim 23 further comprising an actuator, and wherein the output comprises a controlled electric current coupled to the actuator.

25. The apparatus of Claim 24 wherein the controlled electric current is controlled by pulse width modulation.

26. The apparatus of Claim 24 wherein the controller circuit further comprises a digital-to-analog converter providing the controlled electric current.

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27. The apparatus of Claim 24 wherein the sensed position signal is derived from a read/write head.

28. An apparatus comprising:

adaptive parameter data based on at least one of a torque and an inertia; and

a controller circuit for receiving a sensed position signal and adapted to receive reference data indicating a desired position, for adaptively generating an output which is based on the adaptive parameter data.

29. The apparatus of Claim 28 wherein the controller circuit comprises first and second controllers that are stable.

30. The apparatus of Claim 29 wherein the first and second controllers use an error model.

31. The apparatus of Claim 28 wherein the sensed position signal is sensed by a read/write head.

32. A method comprising the step of adaptively generating an output responsive to a sensed position signal, a desired position signal and at least one of a torque and an inertia.

33. The method of Claim 32 wherein the output is controlled based on adaptive parameter data.

34. The method of Claim 33 wherein the adaptive parameter data is updated based on at least one of a torque and an inertia.

36. The method of Claim 32 wherein the output is coupled to a voice coil motor in a disc drive.

Appendix B

Baba U.S. Patent 5,875,162

Clare et al. U.S. Patent 5,898,286

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Appendix C

W.L. Gore & Assoc. v. Garlock, Inc., 220 USPQ 303, 313 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984).

ATD Corp. v. Lydall, Inc., 48 USPQ 2d 1321, 1328 (Fed Cir. 1998).

In re Pardo, 214 USPQ 673, 677 (C.C.P.A. 1982).

In Re Hyatt, 708 F.2d 712, 714-715, 218 USPQ 195, 197 (Fed. Cir. 1983).

Spectra-Physics, Inc. v. Coherent, Inc., 827 F. 2d 1524, 3 USPQ 2d 1737 (fed. Cir.), cert denied, 484 U.S. 954 (1987).